SORRENTO VALLEY ASSOCIATES, INC.

CONSULTING ENGINEERS
COMPUTER APPLICATIONS

Dual Density ZVX4 CP/M Connect Software Configuration Guide

SCS-D07-1 rev 1 1/18/82
Compatible with ZVX4 firmware version DDF2-9

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RELOCATING DDZVX4B.COM ON YOUR 56K CP/M SYSTEM DISK

The CP/M STARTUP KIT sold by SVA does not contain the CP/M operating system. The DDZVX4B.COM program must be moved from the SVA disk onto a CP/M system disk before use.

A. For those users who have two mini-floppy drives, the relocation may be accomplished quite easily by using the PIP program supplied on MicroSoft's CP/M system disk.

B. For those users who have only one mini-floppy drive, the following sequence will relocate the DDZVX4B.COM program on to the CP/M system disk:

1) Boot the system on your mini-floppy drive using the 56K CP/M system disk.

2) Type "DDT" then hit the return key <CR>.

3) Remove the 56K CP/M system master disk from the drive and then insert the CP/M STARTUP KIT disk from SVA.

4) Type "IDDZVX4B.COM" then hit the return key <CR>.

5) Type "R" then hit the return key <CR>.

6) Remove the CP/M STARTUP disk and re-install the system master disk.

7) Type "<CONTROL>C".

8) Type "SAVE 12 DDZVX4B.COM" then hit the return key <CR>.

9) Now execute the CONNECT PROGRAM by typing "DDZVX4B" then hit the return key <CR>.

To run CP/M on your eight inch drives, boot the 56K CP/M system disk with DDZVX4B.COM that you have just created and then run the DDZVX4B.COM program. The eight inch drives will be recognized as B: and C: by the Apple CP/M system.

The same process may be used to relocate DDZVX4C.COM on to your 56K CP/M system disk. The eight inch drives under this program are recognized as C and D.

Please use the program supplied on the SVA distribution software for your controller card to format or reformat eight inch floppy disks.

INTRODUCTION.

The Dual Density ZVX4 connect program is the software link that "connects" Microsoft's 56K CP/M system on the Apple][computer through SVA's dual density disk controller to standard 8" floppy disk drives. After connecting the software drivers, two 8" disk drives may be used under CP/M as either logical drives B: & C: or as logical drives C: & D:. These drives may be used in either single or double density, and in either single or double sided modes. This allows up to nearly one megabyte of on line storage per floppy disk drive.

SYSTEM REQUIREMENTS.

The hardware required for dual density operation is as follows:

1) An Apple][or Apple][plus computer.
2) One 16K byte language card.
3) One Microsoft Z80 SoftCard.
4) At least one Disk][floppy disk drive (Apple five and one quarter inch).
5) An eight inch ZVX4 dual density disk controller from SVA.
6) One or two eight inch standard Shugart compatible floppy disk drives (also available from SVA).

The software requirements are:

1) A 56K Microsoft CP/M system, version 2.20 or 2.20B.
2) ZVFORMAT program (comes with the ZVX4 controller card).
3) Version 2-9 or later of the firmware on the ZVX4 card.
4) DDZVX4B or DDZVX4C connect program. (Both are furnished.)

ACKNOWLEDGEMENTS.

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Z80 SoftCard is a trademark of Microsoft Inc.

VERSION 1 UPDATE

Version 1 of SVA's Dual Density ZVX4 CP/M Connect Software replaces version 0, the initial version, as of 1/18/82. Along with the software upgrade is a firmware upgrade: version DDF2-9 of the ZVX4 ROM firmware. The firmware upgrade eliminates the 10ms. seek problem documented at the end of the rev. 0 of this manual. The software revision will significantly enhance the speed of double density operation, and give the user the choice of two drive configurations.

IMPORTANT! The double density floppy disks created by this version are NOT COMPATIBLE with the double density disks created by the initial version. The interleave factor for double density has been changed from 2:1 to 4:1. This means that consecutive logical sectors on the disk are now physically spaced every fourth sector. This will speed up the double density access time considerably. Double density disks created by the 2:1 interleave will not report any kind of error if read, however the order of data on the disk will be scrambled in sector size chunks. The disks may APPEAR COMPATIBLE, but they are not compatible at all.

To upgrade one's library of 2:1 disks, all files must first be copied from double density to single density using PIP or the equivelent; this MUST be done using revision 0 (DDZVX4.COM) of the connect software. Then the files may be re-copied to newly formatted double density disks using revision 1 (either DDZVX4B.COM or DDZVX4C.COM) of the connect software. All converting should be done with version DDF2-9 of the firmware. The out of date 2:1 interleaved double density disks should then be re-formatted in order to completely erase the scrambled directory. Note: the actual format of the double density disks has not changed; the same format program is used.

The other change in revision 1 concerns the drive assignments. The two 8 inch drives may be addressed as B: & C: (A: is a 5 1/4 inch drive) or as C: & D: (A: & B: are 5 1/4 inch drives). This is reflected in the fact that there are now two connect programs supplied, DDZVX4B.COM and DDZVX4C.COM. This change is to aid users who have software packages that can be accessed as drive B:.

UPGRADE

1) Install new ZVX4 firmware, version DDF2-9.
2) Boot CPM56, run version 0 of connect: DDZVX4.COM.
3) PIP all files from existing double density disks to single density disks.
4) Format another set of double density disks. Label them as "REV. 1" or "4:1".
5) Boot CPM56, run version 1 of connect: DDZVX4B.COM or DDZVX4C.COM
6) PIP all files created in step 3 to new double density disks created in step 4.
7) Re-format all old 2:1 interleaved double density disks.

SYSTEM DOCUMENTATION.

This document only describes the use of the DDZVX4 connect program with Microsoft's 56K CP/M. All other documentation, including the use and installation of the ZVX4 controller, installation of the 8" floppy disk drives, and formatting of the 8" floppy disks is contained in the ZVX4 User's Manual that comes with the controller card. The user should not attempt to connect dual density CP/M until having first understood how to install and use the ZVX4 controller. In the same spirit, the user should first be familiar with the operation of CP/M on the Apple computer before connecting in dual density capability.

The scope of the document is therefore limited to the use of DDZVX4 connect, and the use of CP/M after the dual density drivers have been connected. Included is a desricption of how CP/M views the 8" disks, what the new memory configuration is, and such aspects as how to change densities or sidedness.

CONNECTING CP/M TO THE 8" DISK DRIVES.

There are two connect programs supplied with version 1 of this product. One is called DDZVX4B.COM, and the other is DDZVX4C.COM The only difference between them is that the former configures the Apple for three drives, one 5 1/4 inch and two 8 inch; while the latter configures the Apple for four drives, two 5 1/4 inch and two 8 inch. The following chart shows the drives assignments for both of the programs. Slot and drive are the locations of the floppy disk controllers in the computer. Note: Apple 5 1/4" controllers address up to two drives, numbered 1 to 2; while the ZVX4 8" controller adresses up to four drives, numbered 0 to 3.

DDZVX4B.COM		Slot	drive
A:	5 1/4"	6	1
B:	8"	7	0
C:	8"	7	1

DDZVX4C.COM		Slot	drive
A:	5 1/4"	6	1
B:	5 1/4"	6	2
C:	8"	7	0
D:	8"	7	1

With respect to version 0 of this product, DDZVX4C.COM configures the Apple the same the old DDZVX4.COM does. Note however, that the two programs are not the same as the double density interleave factor has been changed in version 1. DDZVX4B.COM is supplied for those users who specifically need megabyte capacity addressed as CP/M drive B:. Throughout the rest of this documentation, DDZVX4d.COM will represent either of the two connect programs.

Connecting in the software drivers is very simple. The user merely runs the connect program called DDZVX4d.COM on the distribution disk. This file has the software drivers and the connect logic to properly initiate communication with the 8" disk

drives. This program must end with a warm boot, therefore a CP/M system disk must be in logical drive A: when the connect is complete. The most staight forward way to do this is to first copy the file DDZVX4d.COM from the distribution disk to your system disk, then to run it. The file may be copied from the distribution disk to the system disk by use of the CP/M program PIP if you have two 5" disk drives, or it may be copied using DDT if you have only one 5" drive. See the CP/M user manuals for details on how to use these programs. If the file is copied using DDT, then you will save the file on the system disk using the CP/M SAVE command. This last step needs to know how many 256 byte pages of memory to save, twelve are needed. For example:

A>SAVE 12 DDZVX4d.COM

Once the file has be copied over to the CP/M system disk, it may be run by typing "DDZVX4d". The connect program should display a title message and a copyright notice, followed by a message informing you that the dual density drivers are being connected. The program will also tell you whether you are connecting the 8 inch drives as drives B: & C: or as C: and D:. Note: the drivers may be connected only once, subsequent connects are not performed, and the corresponding message will not be displayed. The connect lasts as long as the system lasts, that is until the next power down, or "PR#x". The connect remains intact after warm boots, that is, after either CP/M program termination or after entering a control-C.

USING THE 8" DISK DRIVES.

Once the drivers have been connected, up to two 8" disk drives may be accessed; these drives are referenced as either CP/M logical drives B: & C: or as C: & D: depending on which connect program is used. NOTE: the ZVX4 controller itself may handle up to four drives, called drives 0, 1, 2 and 3. The two logical CP/M drives refer to ZVX4 physical drives 0 and 1. See the ZVX4 User's Manual to make sure your floppy disk drives are properly matched with ZVX4 drives 0 and 1.

The new 8 inch logical drives may now be used in the normal fashion as decsribed in the CP/M user manuals, along with one or two 5" disk drives, drives A: and B:. If DDZVX4B.COM was used as the connect program, then only one 5" disk drive may be used, otherwise two 5" drives may be used. Drive A: is required since CP/M will still need to warm boot from it. The only difference will be that the new drives are bigger.

The new drives are initially considered to be in the single density single sided mode. This is the industry standard format (IBM 3740) and makes software easily transportable from another CP/M system to your Apple CP/M system. The mode may be changed however be an automatic software mechanism inside the 8" disk

drivers (described below), and you need not worry if your disk is not single density, single sided.

DISK TYPES.

The 8" floppy disks may be any one of four different "types"; they may be either single density or double density, single sided or double sided. Throughout this documentation these four types are abbreviated SDSS, DDSS, SDDS, DDDS. Whenever the CP/M directory of an 8" disk is read, the floppy disk driver will type the diskette, that is it will determine to which of the four kinds listed above the disk belongs. The driver will automatically update and adjust all tables of disk information, and for the most part this is totally transparent to the user. The end result is that the user may change densities and/or sidedness without any special requirments.

There are limitations of course. The proper time to change a disk is between file operations since a new file operation will cause the directory to be read, thus re-typing the disk. This limitation is no different than before since disks should never be changed while there are files open on them.

DISK SPECIFICATIONS.

This section describes the four kinds of disks with respect to their logical and physical characteristics. The first table gives their logical appearance, as seen by CP/M. The disk definition is given for those users that need to know that level of detail (and presumably understand what a CP/M disk definition is, see the CP/M user manuals). Briefly though, the values represent: the first sector of a given track, the last sector of a given track, the blocksize, the number of blocks per disk, the number of directory entries, the number of checked directory entries, and the track offset to the first block. The number of sectors given is the number of CP/M 128-byte sectors on the usable portion of the disk, not counting tracks 0 and 1. The interleave is the number of physical sectors spanning one logical sector. All 8" disk interleaving is performed by the floppy drivers; from CP/M's point of view there is no interleaving, and the sector numbers are zero based (despite the 1 given as the first sector number in the disk definition). Thus there is no logical difference between DDSS and SDDS.

TYPE	CP/M DISK DEFINITION	# SECTORS	INTERLEAVE
SDSS	1, 26,,1024,243,64,64,2	1944	6
DDSS	1, 52,,2048,243,96,96,2	3888	4 (rev. 1)
SDDS	1, 52,,2048,243,96,96,2	3888	6
DDDS	1,104,,2048,486,96,96,2	7776	4 (rev. 1)

The next table specifies the physical characteristics of each kind of disk. This is merely a reflection of how the disks are formatted with the ZVFORMAT program supplied with the ZVX4 controller. The table is mostly self explanatory, however it should be noted that tracks 0 and 1 are always formatted in the single density format. # SECTORS is the number of sectors per track, # BYTES refers to the number of bytes per sector, and SKEW refers to any physical interleaving of the sectors on a given track.

TYPE	# SIDES	# TRACKS	# SECTORS	# BYTES	SKEW
SDSS	1	77	26	128	NONE
DDSS	1	77	26	256	NONE
SDDS	2	77	26	128	NONE
DDDS	2	77	26	256	NONE

MEMORY LAYOUT.

This section describes the memory layout of the Apple with respect to the 8" floppy disk drivers. The user should consult both the Apple manuals and Microsoft's manual for a complete discussion of the memory map for the Apple CP/M system. All addresses are given in hexadecimal.

The floppy disk drivers reside in the unused bank of the Apple language card. Without going into too much detail describing what is already described in the above mentioned manuals, the language card is basically another 16K bytes of random access memory that extends the 48K Apple to a 64K Apple system. Almost. There is a 4K chunk of memory that is a dedicated I/O page, this address space is directly above (with respect to 6502 addresses) the 48K limitation of the Apple, and so it intrudes into the 16K of address space on the language card. So although there is 16K of RAM on the language card, there is only 12K of address space. The other 4K of RAM is bank switched with another 4K of address space in the language card.

The other 4K bank of memory is not directly addressable by either the 6502 or the Z80 processors, therefore it is not used by the Apple CP/M system. This 4K of address space is in the Z80 range from B000 to BFFF. It is in this unused bank that the 8" floppy disk drivers reside. Of course some other code is needed to switch between banks before going to the drivers. Also, CP/M must be able to directly address certain data structures in the drivers. Therefore 256 bytes of memory are used for global data structures and bank switching code that is not in the unused bank of the language card. The following table describes which parts of the Apple system are used by the dual density drivers:

Z80 addr	6502 addr	Description
B000..B5FF	D000..D5FF	8" drivers, in unused bank
B600..B6FF	D600..D6FF	256 byte buffer for double density
F200..F2FF	0200..02FF	Bank switching code & global data

There should be no conflicts or problems with using these addresses unless your Apple CP/M system has some other specialized code unknown to the 8" drivers that use the same address space.

ZVX4 CONTROLLER INTERFACE.

As previosuly stated, the user should first consult the ZVX4 User's Manual before attempting to use it with Apple CP/M. The purpose of this section is to explain only those features of the ZVX4 that pertain to dual density CP/M, namely the switch settings.

Switch 1 controls the sidedness. When dual sided operation is selected, the 8" disk drive system should perform as described above in this manual, allowing all four kinds of floppy disks to be used interchangably. However, if your 8" disk drives and/or floppy disks are limited to single sidedness, then you may wish to select the single sided mode via switch 1. This will cause the disk typing routine to go somewhat faster since it will only check the density (single or double) of the floppy disk. On the other hand, failure to have the ZVX4 in the dual sided mode when typing double sided disks will cause the disk typing routine to work incorrectly.

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COMPUTER APPLICATIONS

ZVX4 PASCAL
Configuration Guide

SPS-D07-5 rev 0
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Compatible with ZVX4 firmware version DDF2-9 or DDF2-9N
Compatible with APPLE PASCAL version 1.1

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ZVX4 AUTOBOOT PASCAL SOFTWARE

INTRODUCTON

The SVA autoboot PASCAL software will allow you to configure the APPLE PASCAL language system so that it will boot directly from 8" diskettes witnout a 5-1/4" disk drive. The SVA software is distributed on a 5-1/4" diskette in order that an 8" PASCAL system diskette can be generated without the requirement that 8" APPLE PASCAL already be operational on your system. If you do not have a 5-1/4" drive, it will be necessary to generate the first system diskette with a borrowed 5-1/4" drive . Once this has been done, further use of a 5-1/4" drive will not be required.

The process of generating the 8" system disk has been simplified through the program MAKESYSTEM.CODE on the distribution diskette. This program will automatically generate the 8" equivalent of the 5-1/4" diskette APPLE1:.

FEATURES OF SVA 8" PASCAL DRIVERS

The SVA 8" PASCAL drivers are a set of memory resident assembly language routines which interface the APPLE PASCAL operating system to 8" drives via ZVX4. The software drivers reside in one of two areas of memory, on the PASCAL heap (the free memory area under the PASCAL system) or in bank 2 of the language card. The particular configuration will depend on the presence or absence of the file NOMINI.DRIVER on the boot diskette. If the file is absent at boot time (either removed or with its name changed) the drivers will reside on the PASCAL heap. If the file is present the drivers will reside in bank 2 of the language card, overlaying the 5-1/4" drivers. This will free the memory normally occupied by the 8" drivers (approximately 1K) at the expense of not being able to access the mini as units #11: and #12:.

In addition, if an 80 column card recognized by the system is being used (i.e., one that does not require special software drivers), another 1K of memory (half of the screen memory) will automatically be de-allocated by the PASCAL system. So, using the overlay feature guarantees the same amount of free memory for the user as would be available if mini drives alone were being used.

The PASCAL operating system remains unchanged when used with the SVA drivers, with the exception of the mapping and size of the disk units. The mapping of the PASCAL disk units when booting from 8" drives is as follows:

UNIT	CORRESPONDING DRIVE
#4:	8" drive #1
#5:	" #2
#9:	" #3
#10:	" #4
#11:	5-1/4" drive #1 (in slot 6)
#12:	" #2 "

Units #11: and #12:, the mini drives in slot 6 cannot be accessed if NOMINI.DRIVER was present on the boot disk at boot time.

The capacities in PASCAL blocks of the different diskette configurations are as follows:

Single density, single sided	494
Single density, double sided	988
Double density, single sided	988
Double density, double sided	1976

These are the number of blocks that should be specified when zeroing a disk using the Z(ero command in the Filer.

The PASCAL drivers for the ZVX4 perform automatic density and sidedness detection, which means diskettes with differing sidedness and/or density can be on line concurrently. A disk unit is 'typed' for its sidedness and density whenever block 2 (the first directory block) is read. This is performed very frequently by the operating system, so the chances of the drivers mistaking a disk are slim -- but not impossible!! If different sided disks are being swapped, a 'typing' error can be avoided by listing the directory (which forces a read of block 2) before doing any writing to a disk.

The disk typing operation performed by the 8" disk drivers checks for both the sidedness and density of a disk. The side checking can be defeated by closing DIP switch #1 on the ZVX4. The reason for the switch option is the side checking can result in noticeable delays when single sided disks are being typed. This is due to internal retries performed by the floppy disk controller chip which cannot be overridden. If single-sided disk drives are being used the delay can be eliminated via switch #1. The switch must be left open if double-sided drives and double sided diskettes are being used.

DISTRIBUTION DISKETTE CONTENTS

The distribution diskette ZVPAS: is a standard 5-1/4" PASCAL diskette. The following files should also be present on the diskette:

PASCAL.DOC.TEXT

This documentation.

PBOOT

6502 assembly language code which is the first stage boot code. This code resides on track 0, sector 1 of a bootable 8" PASCAL system diskette. MAKESYSTEM.CODE and WPBOOTER.CODE write PBOOT to the appropriate disk.

UNITDRIVER

6502 assembly language code file which contains the heap resident drivers and the second stage boot code. This code resides on the remainder of track 0 of a bootable 8" PASCAL system diskette; it is written to track 0 by either MAKESYSTEM.CODE or WPBOOTER.CODE and is read into memory at boot time by PBOOT.

CONNECT.DRIVER

6502 assembly language code file similar to UNITDRIVER containing temporary 8" drivers. CONNECT.DRIVER is loaded into memory by MAKESYSTEM.CODE if the user has booted from a 5-1/4" diskette.

NOMINI.DRIVER

6502 assembly language code file containing the 8" drivers which overlay the 5-1/4" drivers. This file must be resident on an 8" boot disk at boot time if the user wishes to overlay the mini disk drivers (a memory saving feature).

MAKESYSTEM.CODE

Pascal code file which first writes PBOOT and UNITDRIVER to track 0 and then copies APPLE1: to an 8" diskette.

WPBOOTER.CODE

Pascal program which will write PBOOT and UNITDRIVER to track 0. This code must be executed whenever you wish to make a PASCAL system disk bootable.

CONFIGURATION PROCEDURE

Note: The following instructions assume that the you have some experience with the PASCAL operating system.

If you are using your 8" disk drives for the first time, we recommend that the you exercise them under APPLE DOS before proceeding, just to insure the hardware is working properly.

Format two 8" diskettes using the formatter program on the DOS distribution diskette. (This is the diskette that was included with the controller at purchase time). These will become the 8" system diskettes.

The following operations will create SYSDSK:, which will be your first 8" PASCAL system disk. It will contain all the system files on the mini diskettes, APPLE1: and APPLE2:.

1) Configure your system as follows:

   a) Slot 0 APPLE Language card or equivalent (requires a 48K APPLE)
   b) Slot 1..5 Other interface cards or empty
   c) Slot 6 APPLE mini disk controller
   d) Slot 7 ZVX4 controller (with autoboot ROM)
   e) DIP switch #1 on ZVX4 should be in the open position if you are using one or more double sided drives.

2) Power up and HIT RESET. You should see the BASIC prompt.

3) Insert APPLE1: into volume 4 (mini DRIVE 1) and a newly formatted 8" diskette in DRIVE 1.

4) Boot APPLE Pascal from the mini disk by typing: PR#6 <return>

5) Back up the ZVPAS: mini-diskette using the TRANSFER operation in the FILER.

   ie. Transfer? #4: <return>
   To where? #5: <return>

   (this assumes two mini disk drives)

6) From the APPLE Pascal command line, eX(ecute MAKESYSTEM. You will be asked to do the following:

   a) Insert a blank 8" diskette in drive #1.

   b) Place ZVPAS: in volume #4 (it should already be there since MAKESYSTEM has just been executed).

c) Type "S" to start. When "S" is typed the boot files PBOOT and UNITDRIVER will be written to track 0 of the 8" diskette. Next, you will be asked to insert APPLE1: into volume #4 and type "C" to copy. Doing so will cause the contents of APPLE1: to be transferred to the 8" disk. The 8" disk will have been given the name SYSDSK:, and is a bootable 8" PASCAL disk.

8) When the copy operation terminates, the 8" diskette can be tested. Remove all diskettes from the drives, power down and then power up. Insert SYSDSK into DRIVE 1 of your 8-inch drives; after some headshuffling you should be greeted with the APPLE PASCAL prompt. If this does not occur, try steps 1 through 7 once more. If you still are not successful, please contact your local Apple dealer or the dealer from whom you purchased this software for assistance.

9) Now that you have created SYSDSK: your first operation should be to make a backup copy of the diskette. The backup operation is performed from the Filer using the Transfer command. Also, since the backups need to be bootable, and the Filer does not copy the boot track (track 0) you will need to eX(ecute WPBOOTER, which will write PBOOT and UNITDRIVER to the boot track (the reason the FILER does not transfer the boot track, track 0, is block 0 begins on track 1).

CREATING 8" SYSTEM DISKETTES FROM 8" DISKETTES

After having configured the first 8" system disk using MAKESYSTEM, subsequent system disks can be created by transferring the appropriate system files using the Filer and then writing the booter code to track 0 by executing WPBOOTER. If a new or reformatted 8" disk needs a new directory the Z(ero command in the filer can be used (with the operator specifying the appropriate number of blocks).

WPBOOTER.CODE writes the PASCAL booter code onto track 0 of an 8" PASCAL system diskette. This must be done any time a new PASCAL system diskette is created.

The files used by WPBOOTER are PBOOT and UNITDRIVER; they contain the code written to track 0 and must be on the source volume number requested by the program. The prompt sequence for WPBOOTER is as follows:

'Enter source volume no:'
Reply with the volume number (do not use "#" or ":") that contains the files UNITDRIVER and PBOOT followed by <return>.

'Enter destination volume no:'
Reply with the volume number to which the booter code is to be written followed by <return>.

'Insert source into volume X'
'Insert destination into volume Y '
'Type "W" to write PASCAL booter:'
Reply with a 'W' followed by a <return>.

If the boot writing operation was successful you will receive the prompt:
'Another disk (Y/N) ? '
A "Y" will return the program to the insert prompt above.
A "N" will terminate the program.

If the operation was unsuccessful you will receive an error message. Usually an error message implies a bad sector either on the source diskette (read error) or the destination diskette (write error). A read error can be checked by doing a bad block scan (in the Filer) of the source diskette. A write error cannot be checked by the same method, since track 0 is not checked by a bad block scan. The recommended procedure is to reformat the destination diskette and try again.

PHYSICAL DISK I/O with ZVX4

APPLE PASCAL has the facility for performing direct disk I/O via the system intrinsics UNITREAD and UNITWRITE. Special considerations must be made when performing direct I/O with double sided and/or double density 8" diskettes. The ZVX4 drivers treat a track on side 1 (the back side) of a double sided diskette as an extension of the corresponding side 0 track. So a double sided diskette appears as having twice as many sectors per track (52 versus 26). Any translations from the sequential sector requested to the absolute track, sector, and side should take this into account.

Double density density diskettes are formatted with 256 byte sectors, single density with 128 byte sectors; buffers should be sized accordingly.

Proper access of a diskette requires that the diskette be properly 'typed'. Typing of a diskette can be forced by doing a BLOCKREAD of block #2. If disks are being swapped frequently, a deliberate typing operation may prevent loss of a diskette's contents.

On double density diskettes track 0 is single density, which means the first 26 sectors (0-25) of a double density diskette cannot be accessed using UNITREAD or UNITWRITE. Applications that require track 0 access can use the firmware entry points. Please consult the ZVX4 manual for details.